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Journal of the Society of Arts.

FRIDAY, MARCH 21, 1856.

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FOURTEENTH ORDINARY MEETING.

Wednesday, March 19th, 1856.

The Fourteenth Ordinary Meeting of the One Hundred and Second Session was held on Wednesday, the 19th inst., Dr. J. Forbes Royle, F.R.S., in the chair.

The following Candidates were balloted for and duly elected Ordinary Members :—

Fraser, James William.
Hutchison, John.
Keeling, Henry L.
Llewelyn, J. D.
Metford, William Ellis.
Moore, E. W.
Smith, William.

The paper read was

ON THE PRINCIPLES REGULATING THE TRANSFER OF USEFUL PLANTS OF ONE COUNTRY TO ANOTHER.

By Maxwell T. Masters, Lecturer on Botany at St. George's Hospital, London, and Sub-Curator of the Fielding Herbarium, Oxford.

At a time when the earth is ransacked in search of new materials to supply the requirements of commerce; when means are devised whereby the supply and culture of the old materials may be increased or extended; at such a time it has been thought by the Council of the Society "that the enunciation of the general principles that should regulate the introduction of useful plants for cultivation into any country, would have a beneficial effect in preventing the loss and disappointment that arise from well-meant but injudicious attempts to transfer the productions of one country to another." If, in treating this extensive subject, I confine myself to principles, it will be for the reason that, however imperfect my appreciation of the principles, my lack of acquaintance with the practice must be yet greater. If we would command Nature, we must obey her laws.

The laws that regulate the natural diffusion of plants over the surface of the globe, or, at least such among them as are in action at the present epoch, must, when subjected to certain necessary modifications, be our best guides in the attempt to naturalise a plant in a foreign country.

The study of these laws constitutes the science of Botanical Geography—a branch of knowledge which, if it may not be said to have originated in, at least received its first great impulse from, the comprehensive mind of Alexander Von Humboldt. The wide field of observation and speculation that it embraces—its dependence on the other branches of knowledge, combined with the extensive acquaintance with vegetable physiology and systematic botany that it demands, have sufficed to raise this young science to a very high rank.

It must further show its right to hold such a position, by contributing to the relief of the necessities and the increase of the comforts of mankind. Its capabilities in this respect will be very great; already its conclusions tally well with the results of experience; and were its warning voice heeded, the sources of failure would be greatly diminished. As the science waxes stronger and stronger, so will its power of conferring direct benefit increase. We do not look for support from an infant; but from an infant of such promise as is this science we may very confidently look for great assistance hereafter. Be it my task now to allude to some among its principles that appear to me to be more or less capable of a practical interpretation.

The diverse vital endowments and the varied structure of plants impose on them different conditions of existence. Unless these conditions are complied with, the *life* of the plant cannot be sustained. Climate was early recognised as the most important of the physical agents that influence the life of plants. The intimate relation that exists between the variety of vegetable products and the diversity of climate is obvious. In attempting, then, to naturalise a plant of one country in another, one of the first things to be inquired into is as to the similarity that exists between the climate of the two places. Some of the elements that constitute a climate appear to be of infinitely greater importance to vegetation than others, and these are the only ones that need at present occupy our attention. Foremost in importance is temperature. At the outset, then, we have to apply to the meteorological observer for a knowledge of the climatal conditions of the two countries. It may be that no data exist. But even where they do exist, and for meteorological purposes are tolerably correct, yet, in many cases, their applicability to geographical or cultural botany is not only partial, but such that it would lead to false inferences. Thus, the attempt to reconcile the facts of the distribution of plants according to meteorological conditions alone frequently fails. Plants rebel against isothermal and isochimenal lines; they will not be tied down by mean monthly temperatures, still less by mean annual ones. Hence the necessity of devising some other means whereby the records of the thermometer may be made available for cultural purposes. Boussingault, by calling in physiology to the assistance of meteorology, has partially effected this. He judged that a plant requires a certain aggregate amount of heat in order to live; a certain larger amount to enable it to perfect its flowers, ripen its seeds, or elaborate its secretions. He calculated the quantity of heat so required, by observing the mean temperature of the period occupied in the performance of this or that function. Then, by multiplying the mean temperature by the number of days, he obtained a product which represented the *sum* of the temperature required by the plant.

The sum is nearly the same in all countries capable of affording the requisite amount; as increased duration of heat compensates for its deficient intensity.

This method, though liable to many objections, is still partially applicable to tropical countries, or to localities having an equable climate free from extremes of heat or cold.

M. A. De Candolle, in his most elaborate work on Botanical Geography, recently published, points out numerous sources of error in M. Boussingault's plan; and one of which is of too great importance to be here passed over. It is, that in this method, degrees of temperature that are either useless or noxious to the plant, are liable to be included, as well as those that are useful. This objection applies, with still greater force, to calculations based simply upon the results of thermometric observations, without considering the growth of the plant during the interval of which the temperature is calculated. For instance, it is well known that a temperature of 32° Fahr. puts a stop to the activity of vegetation in all plants. Many plants, too, will not bear so low a temperature as 40° Fahr., except for a short period. M. De Candolle particularly urges the recognition of the fact that temperatures below 32° Fahr. are not necessarily more injurious than the temperature of the freezing point. All degrees below this point are simply useless, as far as the plant is concerned. The plant remains dormant. Hence, M. De Candolle proclaims the necessity of rejecting from the meteorological tables, that are to be applied to the facts of vegetation, all temperatures below the freezing point. The application of this correction to the thermometric records we possess, would be too immense a labour to be accomplished, even if the necessary data were accessible; for it would be necessary to know, not only the *mean* temperatures, but also the figures from which those means were computed.

By way of illustration, M. De Candolle has applied this correction to the records of the thermometer at Geneva, during those months in which frost is likely to occur.

From his table I will select one or two examples. The mean temperature for December, 1844, calculated according to the ordinary method, was 31°.6 Fahr.; whereas, if the degrees useless to the plant are excluded, the mean is 33°.7 Fahr. In January, 1845, the mean temperatures, calculated by both methods, were respectively 34°.1 and 35°.2 Fahr. In February, 1845, 27°.2 and 34°.3.

Hence it is that certain alpine plants, in the neighbourhood of Geneva, may experience a certain useful amount of temperature, which enables them to flower at a time, when, according to the mean temperature, as ordinarily calculated, they would be unable so to do. The difficulty or impossibility of making similar calculations for all places of which the mean temperature is known, has led M. De Candolle to suggest another method, whereby the error resulting from the calculation of useless degrees of temperature may be in some measure avoided. He proposes to take, as a starting point from the ordinary meteorological tables, the day in spring on which the mean temperature rises above a certain degree, say 33° Fahr., then to ascertain the day in autumn or winter having the same mean temperature, and to calculate the aggregate amount of heat during the interval, by Boussingault's method, that is to say, by multiplying the number of days by their mean temperature.

It will be remarked that there may have been days before the one selected as a starting point, on which the temperature may have arisen above 33°, although the mean temperature may not have risen above that degree. This error, M. de Candolle thinks, is compensated for by the converse fact, that the temperature may fall below 33° after the day fixed on as a starting point; so that the high temperatures that occur before the time fixed on are balanced by the low temperatures that occur after. This method is of course only approximative.

As many plants will not bear a temperature even of several degrees above the freezing point, and as each plant has probably, as it were, a zero of its own, below which it cannot exist, so it becomes necessary to adopt this, or some other method, for degrees above 33° up to 40° or 50°. And this is so much the more necessary, because although a plant may live and perform certain of its functions when submitted to an aggregate heat of so many degrees, it may require a larger amount in order to perform other of its functions. We have abundant illustrations of this in the fact that certain plants able to resist our inclement climate, are nevertheless precluded from producing their flowers, or from elaborating the gum, the resin, or other secretion, which in a hotter clime give a value to the plant that it cannot attain here.

In order to show how it is that certain plants are common to, or may be cultivated in, two localities having a very different climate one from the other, M. de Candolle compares the climate of London with that of Odessa. The mean summer temperature of London is 62° F., that of Odessa, 68° F. The difference in the winter temperature is still greater, and the monthly means present no analogy. But, if the day on which the mean temperature arrives at 40°.1 F., be ascertained, and also the day when the temperature sinks to the same point at both of these towns, and the aggregate temperature of the interval be calculated, it will be found that this aggregate amount is nearly the same for both places. In London, the mean temperature of 40°.1 F. begins on or about the 17th of February, and the thermometer falls to the same point on or about the 15th December. The aggregate heat of the interval amounts to 6207°.8. At Odessa, the mean temperature of 40°.1 Fahr. occurs first on the 2nd or 3rd day of April, and on the 17th or 18th of November the same mean temperature is indicated by the thermometer. The duration of the interval is shorter, but the intensity of the heat is greater, and hence the sum of heat is nearly the same as in London—viz., 6193°.4 F. Hence plants that require a heat of at least 40° F., and a sum of heat amounting to 6200°, or thereabouts, will find in both places the requisite conditions.

Up to this point, the effect of temperature on plants has been considered mainly in reference to the influence of cold. Excessive heat is also injurious, though its effects are more difficult to measure, as they are so intimately blended with those produced by a contemporaneous deficiency of moisture. It behoves us, however, not to imagine that a temperature of 80° must necessarily produce twice the effect of a heat of 40°.

The state of the plant, too, in all considerations of heat and cold, must be attended to. The plant which will at one time resist a temperature of 32° F., at another time will perish at 35° F. Much depends upon the period at which the plant is subjected to cold. A plant when at rest can support a very much lower temperature than when vegetation is active, hence it is that the intense cold created by nocturnal radiation is in many cases productive of but little mischief. Sudden transitions from a low to a high temperature are generally admitted to be injurious to vegetation. But to this, even, there are many exceptions. Witness the temperatures recorded by Sir Thomas Mitchell at various places in New Holland. In May (our November), within three or four degrees of the tropic, the thermometer, at dawn, indicated temperatures as low as 20°, as 17°, nay, even as low as 11°. At noon on the same days, the thermometer stood respectively at 82°, 69°, and 67°. At nine in the evening we read respectively—38°, 30°, and 27°.

Furthermore, it will be remembered that perennial plants and trees are subjected to the whole annual range of temperature, whilst the so-called annual plants have an existence of but few months. From this latter class the vegetable food of man is principally derived, and hence he is able to combat successfully with the extremes of drought or cold.

It is scarcely necessary to do more than allude to the decrease in temperature in relation to increased altitude. Attention to this fact renders the culture of plants, natives of temperate climates, possible in the tropics.

At the equator, according to Humboldt, an elevation of nearly 7,000 feet is required for the successful culture of European cereals.

The late M. de Candolle pointed out an analogy between sea-side plants and those growing on mountains, and showed how the denizens of the one situation might frequently be more successfully cultivated in the other locality than elsewhere.

The temperature of the soil is also a point worthy of attention. It is ever less variable than the temperature of the air. In temperate climates the soil is warmer in winter than the atmosphere, and slightly colder in summer; but in the tropics, it would appear that the soil is always warmer than the air.

For agricultural purposes, it is only the superficial layers of soil that need be attended to. The roots of few cultivated plants descend below three feet; by far the great majority do not penetrate so deeply. But inasmuch as the temperature of the soil varies less, and is higher as the depth increases, so plants whose roots penetrate deeply will, *cœteris paribus*, resist cold better than those whose roots are more superficial—a fact in favour of the newly introduced Chinese yam, whose habit it seems to be to descend to a considerable distance in the soil.

The mechanical nature of the soil has, as has been shown by Professor James Forbes, a considerable influence on its power of conducting and retaining heat. Nor must we overlook the fact that the temperature of the soil is in some measure under our control, as shown by the effects of drainage.

The data for ascertaining the heat of the soil are far less numerous than those that afford us a knowledge of äerial temperature. Mr. Thompson, to whom we are indebted for the excellent meteorological observations carried on in the garden of the Horticultural Society at Chiswick, has proposed an approximative method for ascertaining the temperature of the soil from that of the air supposed to be known. Thus, at Chiswick, he finds that the temperature of the soil in winter is from 2° to 3° higher than that of the air. Hence, for places having about the same mean monthly temperature as Chiswick, during the winter, an addition of 2° or 3° to that mean will give the heat of the soil.

For localities with a colder winter temperature 2° or 3° more must be added; and, in some places, 8° or 9°, according to the severity of the winter.

In summer (in temperate climates) we have to subtract from the temperature of the air to ascertain that of the soil. In the tropics, an addition of from 2° to 4° must be made throughout the year. Dr. Lindley's Theory of Horticulture contains a table, constructed by Mr. Thompson, which gives the temperature of the soil at different places, as observed or calculated by the foregoing method, during the seasons in which the plant is growing, ripening, or resting.

The immense influence that light has on vegetation, is not a matter for doubt, though it is difficult to measure precisely its effects. M. Alphonse de Candolle endeavoured to estimate the effect of exposure to full solar light, by watching the growth of plants in the shade, and that of plants fully exposed to the sun's rays. He found that the plants that were exposed grew in a shorter period, and thus received a smaller aggregate amount of heat (as measured by a thermometer in the shade) than those grown in diffused light, owing to the longer duration of growth under the latter circumstances. The difference in the quantity of heat experienced by the plants under the two conditions, thus affords a measure of the *direct* calorific or chemical effects of the sun's rays—a measure expressed in degrees of a thermometer in the shade.

Thus it is, that in climates blessed with an unclouded sky, the amount of *heat* required is less than in countries where the atmosphere is nebulous and overcast.

Thus it is also that certain plants can grow farther north in Norway than they can in Scotland.

Experiments are not wanting to show the relation that exists between the chemical ingredients of plants and the light to which the plants are exposed. The formation of aromatic and other secretions, is at least as much under the influence of intense light as of exalted temperature—probably more so; hence the desirability of ascertaining the relative transparency of the atmosphere and the intensity of the light in different countries.

The humidity of a country is a point of the greatest importance. Not only is it necessary to know the amount of rain that falls during the year, but its frequency and amount in different seasons. Dividing the duration of the life of an annual plant into two principal epochs, that of growth and that of ripening, its cultivation is likely to be the more successful as the rain falls during the growth, and ceases during the maturation, at which latter period a high temperature is more advantageous.

M. de Gasparin cites, in illustration of the necessity of paying attention to the time at which the rain falls, the fact that the introduction of cotton into the South of France was unsuccessful, mainly on account of the early appearance of rain in autumn. In Sicily and Algiers, where the occurrence of rain is longer deferred, the culture has met with success.

The effects of heat and moisture combined, are to produce luxuriant foliage to the detriment of the flower and fruit; in certain instances this would be desirable, as in the culture of plants for forage.

But where the two elements are in due proportion, the combination is the most fortunate one that can happen. Too often is it that with intense heat there is a corresponding deficiency of moisture, a state of things offering the most formidable resistance to the successful introduction of plants destined to flourish in a less ardent clime. The vegetation in some of these hot arid regions consists in great measure of the so-called succulent plants, amongst which is the Cochineal cactus. Bulbous plants also flourish in such like districts. Sir John Herschel records the temperature of the soil of his bulb garden at the Cape of Good Hope as sometimes reaching 159° Fahr.

The effects of forests on the humidity of a climate, and the injurious consequences that result from their indiscriminate removal, are matters to which the attention of the legislature and the public has of late been called.

Before leaving the subject of moisture, I should wish to refer to a remarkable instance of the successful application of scientific knowledge to practical purposes. Availing himself of the hygrometrical qualities possessed by mosses, Colonel Nichols fostered the growth of these plants in the rocky island of Ascension, and is thus reported to have obtained an ample supply of water where there had previously been a deficiency.*

What the influence of the electrical conditions of a climate on vegetation is, is scarcely known, though it would seem probable that it may be considerable.

To the agriculturist in districts where storms are frequent, as in the tropics, the violent hurricanes and torrents of rain that accompany them, must be matters of no little moment.

The direction and force of the wind is also a climatal element of importance, even when not manifesting its powers in the excessive manner just alluded to.

The culture of the hop would be attended with many difficulties in a country frequeutly liable to high winds.

The coarseness of the fibre of hemp, when subjected to such influences, has been not unfrequently remarked.

Soil is not an unimportant subject to be considered, though it is probable that plants can bear a greater deviation from the nature of the soil they prefer than from almost any other requisite condition.

It was the opinion of the late Dean Herbert that wild plants did not necessarily grow in the soil that was best suited to them, but that they grew where they were not subjected to the encroachments of stronger neighbours. Still, it does not admit of doubt that the culture of certain plants has proved impossible or unprofitable from a lack of the soil most congenial to the plant. To this is attributed the small success attending the culture of sugar, cotton, indigo, and tobacco in Ceylon.

Such, then, are some of the more prominent physical circumstances that regulate the natural diffusion of plants over the surface of the globe,—the more important, as they are, comparatively speaking, immutable. Not so inflexible are the vital powers of plants.

Doubtless, each plant would thrive best in a certain temperature or soil; but it is endowed with a power of deviating from this standard, such deviation being limited, and varying in amount in different species.

We have to ascertain by experience what the natural constitution of plants really is.

As for actually changing the constitution of a plant, the thing is impossible; all we can do is to test its flexibility or its power of adapting itself to different circumstances. It by no means follows that the larch is hardier now than it was when sheltered in a greenhouse; simply, its capabilities of resistance were then unknown.

The wonderful results that have been consequent on the efforts of man to avail himself of the almost cosmopolitan habits of certain plants—the success that has been attendant on the trials made on plants with lesser powers of adaptation, hold out great hopes for the future.

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* Vide *Gardener's Chronicle*, 1855, p. 757.

Very many unsuccessful experiments may be attributed to the neglect of scientific principles. True, that science is at present extremely imperfect, but still she is our safest guide in experiments of this kind. In support of this, let me cite the opinion of one whose successful and unremitting labours in this department well qualify him to be a judge in such a matter.

"Scientific investigations," says Dr. Royle, "are, in fact, the only means we possess of obtaining any principles for our guidance in experimenting on the improvement of old products, or in the introduction of new ones into the culture of a country, and by which we can have anything like certainty in the results we are likely to obtain. The absence of such guides in the numerous experiments that have been made in India may explain the almost constant want of success."

To those who are familiar with what is, and has been, effected by means of the Botanic Gardens of Kew, of Calcutta, Saharunpoor, and of many others in our colonies—to those who appreciate the capabilities of scientific societies, at home or abroad, it will not seem strange that I should refer to them as affording the greatest facilities for carrying on such experiments. In some cases, I fear, the value of such institutions is overlooked or ill-understood.

In an experimental garden, not only the power of a plant to resist or adapt itself to altered conditions might be tested, but the conditions themselves might be fully investigated. Thus might meteorology confer great aids on cultural botany. The observations which would seem to be most useful for cultural purposes are those which enable us to ascertain the duration and intensity of useless and of useful temperature—the heat of the soil—the time at which rain falls, and in what quantity—the length of the intervals without rain—the humidity of the atmosphere —besides other circumstances which would be prompted by the peculiarities of the locality, or the special requirements of certain plants.

The judicious selection of plants appropriate to the conditions afforded by the country, and to its requirements, would thus be greatly facilitated.

There need be no fear that the economic limitations, if I may so call them, would be neglected. The expenses of culture, the abundance and cost of labour, the means of transport, the machinery required, the fiscal regulations, all these, and similar circumstances having reference to the successful introduction and culture of plants, might be investigated under such auspices.

As an illustration of this, I may be allowed to quote from the report of the Ceylon Botanic Garden, as reprinted in the *Journal of Botany*. Speaking of plants yielding useful fibres, the Committee recommend that "a popular account should be published in the English and native languages of the plants producing the fibres, the most economical way of preparing them, the cost of labour per hundredweight, &c." The report further says, "that, in order to render any discovery largely beneficial to the colony, it is indispensable that it be suited to the habits of the mass of the people, and of a nature likely to be adopted by them."

One other important element in the success of an experiment may be secured in such an establishment—to wit, Patience. How often does it not happen that after one short trial the experimenter feels obliged to turn his attention to other matters that afford a quicker return? And yet, in many instances, a longer trial—a slight change in the mode of culture—might conduce to the desired end. Time, too, is one of the most potent agencies in overcoming Prejudice—that fertile source of obstacles to the successful introduction or culture of new resources.

A paper on the transfer of plants would hardly be complete without some reference to the best mode of conveying plants on long voyages. But, if much of what I have previously said be trite, so what I can say concerning the mode of transfer must be still more so.

The paramount utility of Wardian cases, in which plants are conveyed in a living condition from country to country, has now long been recognised. Each day confirms the opinion that this mode, where practicable, is the best that can be adopted. Mr. Moore, the curator of the Glasnevin Botanic Garden, thus writes to me in reference to this point:—"I can without hesitation state the Wardian case to be by far the best method to take for importing and exporting living plants. As a proof of this, I have had coniferous and other plants sent to this establishment, which were taken from their natural habitats in the island of New Caledonia, come quite safely, after having been shut up for five months."

The other methods of transporting living plants, are based upon the principle of keeping the activity of the plant dormant during the voyage—of keeping the plant at rest.

The transmission of seeds occasionally presents difficulties. Generally it is found that dryness and free exposure to the air, are the greatest safeguards against premature germination. Some seeds, which present more than ordinary difficulties, may be coated with wax, and thus, by excluding oxygen gas, and preventing either the absorption or the loss of moisture, the vitality of the seed may be preserved. In this way Dr. Royle has succeeded in conveying chesnuts and filberts to the Himalaya when other means have failed.

Trite and ill-digested as many of the remarks made must have been, I would fain hope to have drawn attention to the fact, that there are points in Botanical Geography already discovered of great importance to practical men —facts which, like those afforded by the other sciences, may be made available—

"for profit of the people;
For advantage of the nations."

DISCUSSION.

Mr. P. L. Simmonds said, the subject which had been opened for consideration by Mr. Masters that evening was one of great importance to Great Britain, possessing, as she did, colonies and dependencies in almost every parallel of latitude. And while we had had the principles which should be borne in mind, in transferring plants from one region to another, so clearly laid down, we were also exceedingly fortunate in having in the chair that evening a learned professor, who had devoted almost a life-time to the consideration of this very subject, especially as regarded the introduction and successful culture of all the useful staples and plants into the widely varied climates of India. Those who were familiar with his many valuable works, from the "Botany of the Himalaya Mountains," the "Productive Resources of India," the "Culture of Cotton in India," down to his latest work on the "Fibrous Plants of India,"—would feel that, combined with his long experimental experience in India and his continued labours in that peculiar field of utility, as exemplified in the valuable collections he arranged for the Exhibitions at Paris and London, no one was better fitted to deal practically with the subject in its various details. Without the advantages of theoretical science, practical knowledge was of little avail. Residents and cultivators might discover the properties of unknown plants and trees, but it remained for Science to turn them to their full advantage, and to point out the climates, soils, and localities suited to their growth. The Flora of many of our colonies was still to a great extent undescribed; of the Cape Colony and Natal, we as yet knew little; Ceylon and Australia still offered a wide field for investigation. Dr. Ferdinand Mueller, the Government botanist of Victoria, in the progress of an extensive tour through that colony a couple of years ago, brought to light many useful and heretofore unknown plants; and in his report he stated, "seeds of the indigenous plants have been collected during my journey, as far as season and opportunity permitted, not only for our own establishment, but have also been distributed, to the amount of nearly 2,000 lots, to the Royal Gardens at Kew, the Botanical Gardens of Hobarton, Sydney, Capetown, Mauritius, Calcutta, &c." "We possess (he adds) in the southern hemisphere what the ancients in the northern called *regiones felices*, those happy latitudes of a warm temperate zone, in which nature with a prodigal hand offered prominently, amidst so many other gifts, the cerelia, the olive, and the vine, and to which we here have added, from the far east, the orange and the tea; from India, the rice; and from the New World, the maize, cassava, arrowroot, tobacco, and many other treasures of the vegetable world, on which mankind now rely for luxury and support. All these may be here successfully produced, along with those which we enjoyed in the country of our youth." There were numerous curators of botanic gardens and Government botanists, scattered through our several colonies, but there appeared to him to be less practical benefit derived from their individual labours, than might apparently result from their collective experience and interchange of communication, if they were less isolated in their exertions, and were brought more frequently into correspondence with each other, under some general supervising system. The under current of practical utility might, however, flow silently on, although the result of their labours was not made so generally public as could be desired. And here he would throw it out as a hint, whether the Society's Journal might not be made more frequently the receptacle of information as to the acclimatization of certain plants, the results of experiments as to their introduction, the requirements of particular localities, and so on. In a recent Cape of Good Hope paper he found it stated:—"The little interest shown by the inhabitants of Cape Town in the proceedings and progress of the Botanical Garden Commission, is greatly owing to the want of publicity. No report has been published for years. Work is being done, and improvements are being carried on in the establishment, of which the public generally have not the slightest knowledge. In the evidence attached to the report of the Assembly Committee on the subject, more information has been brought to light than had ever appeared before." We found that most of the principal European and West Indian fruit trees had been introduced and acclimatized in the Cape Colony. The introduction of timber-producing trees had occupied a proper share of attention, Strictly tropical trees had not succeeded well, as might have been anticipated from the situation and exposure; the teak tree had perished altogether; the mahogany and banyan trees, however, seemed to thrive. Many of the European trees, as the ash, the elm, and the sycamore, had made rapid growth. The handsome Indian cedar (*Cedrus deodara*) stood the climate well. Too much could not be said in favour of this valuable tree, whose wood was said to be almost imperishable. The tree itself attained an immense height, and was said to be the most noble of the many noble trees on the Himalaya. The absence of publicity, to which he had alluded was, however, too frequently the result of a want of leisure for correspondence. Thus Mr. M'Gibbon, of Cape Town, in his last report to the commissioners of the Botanic Gardens, stated—"Much of my time, which ought to be devoted to other objects, such as preparing the herbarium, naming the plants, &c., is taken up with actual labour, which, in other places, is usually performed by competent assistants." And yet his report pointed out how much was being done there, the issue of plants from the garden exceeding 14,000 in the year; and he instanced numerous and important additions which had been made to the exotic flora of the colony. There might be some little truth in the following remarks by Dr. Smith, an enthusiastic experimentalist on tea culture in America. He observed, "It may be doubted whether a botanical garden, however able the professor presiding over its interests may be, is exactly the place for a successful experiment. A gentleman who has all the exotics that can be collected from the four quarters of the world under his charge, can scarcely be said to occupy a position that would best qualify him to superintend the cultivation of any new plant upon a national scale. By directing his attention to a great variety of agreeable objects, and spreading his paternal care over so large a family, he, in some measure, disqualifies himself for that constant, minute and practical attention to the plant which, especially when under experiment, it demands at his hands. Such an enterprise requires the infusion of a degree of enthusiasm, —a devotion to the one great object in hand; an attachment to cultivation and horticultural pursuits for the love of them; an untired patience and ardent zeal in communicating instruction to others, upon the subject most immediately in hand, rather than upon the general science of botany; particulars which can hardly be expected from a professed botanist." Most of the European esculent vegetables had been successfully introduced into the East and West Indies, Australia, and the Cape Colony. The cereals and legumes of Europe, however, scarcely gave sufficient returns in tropical climates, even in the elevated regions, for the care and expense attending their cultivation. The fodder plants of Europe, when taken to the East Indies, had not generally succeeded, with the exception of lucerne, which was now largely cultivated in the Bombay presidency by the natives. The Guinea grass and the Mauritius grass might be more generally diffused with advantage. The latter flourished in marshy soils. A Brazilian grass, the *Panicum spectabile*, though growing to the height of six or seven feet, yielded tender and delicate herbage, and was very favourably spoken of by the late Dr. Gardner, of Ceylon. Several South American writers also spoke highly of the Ichu, a tall undefined grass, on which the llamas and guanacoes of Chili and Peru fattened. The Prangos hay of Upper India was another fodder plant, on which Dr. Royle had already given some information; and a species of Bokhara clover was remarkable for the quantity of herbage which it yielded. Experiments had frequently been made in different quarters; in Jamaica, in Brazil, and in the United States, to cultivate the Chinese tea plant. In its native soil it grew most luxuriantly between the parallels of 25° and 35° N. lat. But above 40° and below 20°, the climate embracing the extremes of heat and cold, would scarcely admit of the full growth and development of the tea plant. Thus the attempts to cultivate the plant for its leaf, in Brazil, in Mauritius, Ceylon, and Pinang, had failed, lying, as those places did, too far within the tropics to offer a climate like Assam, which was situated without them. In the island of Madeira, however, at an elevation of 3,000 feet above the level of the sea, the plant had been cultivated successfully, and the leaf produced was of an excellent quality. The olive-plant could be much more generally diffused through our colonies, forming, as it did, a very important staple production for its fruit and its oil. In the north of Africa, Syria, Sicily, and the south of Spain, it throve well, and had succeeded in Calcutta and Western India. In South Australia it had been successfully introduced. The climate of the Cape Colony, and to a certain extent the character of the soil, were both eminently adapted to the cultivation of the olive. Numerous attempts, at different times, had been made to propagate the olive in various parts of the southern States of America, which had proved unsuccessful. Mr. Simmonds concluded by stating that he had thrown out these few hints, connected with the practical transfer of plants from one quarter to another, in the hope that, combined with a study of the principles that should guide cultivators, so ably laid down by Mr. Masters, they might possibly lead to further investigation and inquiry into the wide field of observation and practical utility thus laid open.

Mr. J. J. MECHI had very little to say on this subject, beyond stating that, as a general rule, he had found cereals from cold climates succeed in this country better than those from warm ones. The chairman had kindly furnished him with some from the latter, but they very soon blighted off and died. He believed the cultivation of the Tartarian oat had been attended with as much success as anything that had been attempted in that way. He had listened with great attention to the remarks that had been made that evening, and he was sure that the temperature of the soil had a very considerable effect upon plants, and he attributed the great success of irrigation to the effect it had upon the temperature of the soil. He had found that, in cold weather, putting on spring-water at a temperature of 46°, which was much higher than the temperature of the atmosphere, his crops of rye grass were very much improved and forwarded. Wherever chemical changes take place there was a source of heat, and he had no doubt that the application of manure mixed with water acted more favourably than water alone, owing to the more rapid chemical changes which took place in the sub-soil; and in that way he accounted for the extraordinary difference in the growth of grasses, whether irrigated or dressed with dry manure. He repeated that the effect of the soil upon plants was extraordinary. In soils dressed with marl, some of the indigenous weeds dried out and were not seen again, but a new class of weeds was produced, showing that the soil had considerable effect upon the different productions. It was generally found that bottom-heat had the most extraordinary effect upon all productions. He had a flue running underground in a conservatory, and he found that the camellias and other plants which were influenced by the bottom-heat grew much better than those at a distance from the flue, and where the sub-soil was not influenced by the heat.

Mr. MASTERS begged to ask Mr. Mechi whether he had had any experience with regard to the Peruvian cereals?

Mr. MECHI replied that he had seen Peruvian barley grown to great perfection on the banks of the Thames, by Lord Lonsdale; but he did not know the temperature of the climate from which the stock seed was brought—whether from the hills or not.

Mr. MASTERS remarked that Peruvian barley and wheat had been grown at the Botanical Gardens, at Oxford, and turned out to be a complete failure.

Mr. MECHI had seen a magnificent crop of black barley grown upon the Essex soil.

The CHAIRMAN remarked that black barley was extensively grown in the north of India.

Mr. MECHI—I have grown large crops of it in Essex.

Mr. G. F. WILSON, F.R.S., said,—Mr. Masters had referred to a mode of transporting seeds, preserved from the action of the air by means of a coating of wax. In a note he (Mr. Wilson) received yesterday from Hampshire, from a very zealous and successful cultivator of tropical plants, glycerine was shown to have a remarkable action upon seeds. His friend wrote, "some castor-oil seeds were immersed in glycerine for 10 days; when planted, they germinated very quickly. I then put some of the benee seeds given me last year (some of which my gardener then sowed, but they never came up), into glycerine for 20 days, and I find they are sprouting beautifully; some that were put in water have never appeared. The glycerine must have something to do with even restoring vitality, for I have tried one or two dried up Indian seeds, and they have succeeded also." Mr. Wilson should hardly have expected such very favourable results; but when we remembered the extraordinary power of glycerine as a preservative of both animal and vegetable bodies, he thought it would be well worth while to try some experiments on the transport of seeds in glycerine.

The CHAIRMAN said, having heard from Mr. Masters some excellent remarks as to the necessity of attending to principles in the introduction of plants, he could mention instances to this day, of the total disregard of such principles in the attempt to introduce various plants indigenous to this country into our colonies. A short time since, a gentleman called upon him to say that he had received a letter from a friend in Singapore—which they were aware was situated very nearly under the equator. This gentleman had been anxious to improve the agriculture of the country, and to give some advantages to the Chinese (who were very good agriculturists), and to the natives in that respect. A list was forwarded of the various plants, &c., which he wished to introduce. They consisted for the most part of the products of the kitchen garden of this country, together with the gooseberry, the apple, and the pear; but not one of them would succeed. The necessity of studying the principles adverted to that evening did not appear to occur to the gentleman who was anxious to introduce those plants. A few days ago he (the chairman) received a printed document from Mr. Jefferies, who had gone out as a well-educated gardener to Madras. He considered himself a finished horticulturist; but he found it impossible to carry into practice in Madras the things he had learned at home; but he found that the principles with which he was acquainted were useful in modifying his practice; and in that way he was enabled to do more than had ever been accomplished before, and he was now growing various plants which he had introduced with good success. Mr. Simmonds had referred to the want of success in the propagation of the cochineal in India. It was a remarkable thing that during the long war in India, a great desire was entertained by the Indian Government—after the cochineal had been introduced into Europe—to introduce it into India, and great exertions were employed to effect that object. As a first step, the plant on which the insect fed was introduced, and an officer at one of the American ports collected the insects, which were said to be of the true sort, for the purposes of commerce. The plan succeeded so far as to result in the production of what was, at first, considered to be very good cochineal; but, upon its being sent to Europe, it was found to be the production of an inferior insect, and that therefore the utmost culture of it would be useless to produce good cochineal; the error was in collecting the wrong species of insect; instead of getting it from Mexico, they brought it from Rio Janeiro. As animal substances had been alluded to, he might mention that the Assam silk-worm had been introduced into the south of France; the insect fed upon the castor-oil plant, and it had been thought that, where that plant flourished, this silk-worm would also flourish—but that did not always follow. In this case, the silk-worm introduced was from Assam, one of the richest and moistest soils, and hottest climates of India, where it flourished, and produced a cheap substitute for silk; but to attempt to introduce that silk-worm into the dry climate of Algeria and the south of France, was one of the most impossible things, and all experiments with regard to it had failed. Last year, H. E. Sir W. Reid, Governor of Malta, had written to the Society, stating that the attempts to introduce this silkworm (*Bombyx Cynthia*) into Italy and Malta had failed, which he should quite have anticipated, because a rich and moist climate was essential to the successful culture of that silkworm; while in Granada they had a different set of phenomena, and there it succeeded very well, propagating very rapidly, and demonstrating that considerations of soil and climate were necessary both with plants and animals in new situations. In the cases on which he had given his opinion, he had found it necessary to pay attention, not only to soil, but also to climate, regarding temperature as well as moisture, which two matters must be attended to in the successful introduction of plants. It was difficult to get the exact climate of different places, but it was desirable to approximate as closely as possible; and in the extremes of cold and heat, even for twice a year, they got an approximation; for they found that a plant able to bear cold might be introduced, whilst others would not bear the same degree of cold. Extremes were sometimes very useful, but it was hardly possible to introduce plants successfully without knowing the extremes, both of heat and cold, to which they would be subjected in their new situation. Another mode of judging whether plants could be successfully introduced, was to notice the vegetation with which they were associated. In the tropics they had the dry climate of the Mediterranean, in which plants not requiring much moisture would always flourish; and if they found plants of the same family in association with those which they wished to introduce, he thought they had another means of judging of the probability of success of their experiment. In illustration of this, he might mention that some experiments were made for the introduction of the cotton plant into India. It was assumed that India was a cotton-producing country as well as America, and it was said that India ,was suited for the production of cotton. But the species of cotton were different; the American cotton was different from the Indian cotton; and, although both species might grow in the same climate, yet to make them produce their respective crops in profitable proportions, it was necessary that the element of climate should be so apportioned to those plants, that at the required times there might be moist weather and hot and fine weather which was necessary for each. The cotton of America was cultivated with the greatest success in the districts bounding the Gulf of Mexico—in Louisiana, New Orleans, &c., where there was a long clear summer, with occasional showers, with the air loaded with moisture from the Gulf, which kept the plants in a growing state without excess of moisture. In the introduction of this plant into India, in most parts of which they had a cold climate during one portion of the year, a plant of this kind could not grow under such conditions; at the same time, such seasons were adapted to the growth of the fine wheat which Mr. Mechi had mentioned, and also to other European vegetation,—but only for a few months in the year. The cold season was succeeded by a dry season, from March up to June, with an intensity of heat in the soil that would raise a thermometer to 120 or 130 degrees in a few minutes. Therefore it would be impossible to grow American cotton in India till the middle of June, when the rain would come in vast quantities to the roots, which, combined with the heat, would make the plant grow with great rapidity. But the roots of the plant would be very short in that late season. The plant, nevertheless, had abundance of life, and also showed its fibres, and formed the capsules which contained the cotton. Three months after this, the rains suddenly ceased—the soil dried up; where it was of a clayey character it became as hard as brickbats; and this plant, which never formed long roots, was expected to find nourishment! the evaporation from the leaves became excessive, and they dropped off, but still it was able to produce cotton after that. In this consisted the difficulty of introducing American cotton into many parts of India; at the same time they found that where they had the benefit of two monsoons, this plant succeeded. At a place about fifty miles from the sea-side, they had the benefit of two monsoons, and in that latitude American cotton was cultivated successfully, many hundred acres of it growing there, to the displacement of cereals which the inhabitants were slow to give up; and they got better prices for the American cotton than for their own. Again, with regard to the tea plant—the method was, to study the soil, climate, and vegetation that were favourable to the growth of this plant by the imperfect accounts received from travellers, and such as could be gathered from the works of the Jesuits. This, owing to the contradictory statements given, was not easy to do. But, from a study of all the facts, it was found that there was a particular plant unknown to botanists, except in China and the Himalayas, and it was inferred that if the tea plant would grow in association with this plant in China, it would not be difficult to make it grow in the Himalayas, where those other plants grew. The result had been complete success. The tea plant was introduced, which was left three or four years for seed, and now the China tea plant covered a district of 4½° of latitude and 6° of longitude; and the tea was pronounced to be as good as that of China, being manufactured by the aid of people introduced from China. This plant, it should be remarked, was quite distinct from that of Assam, which latter grew to a large size, in contradistinction to the true China tea plant, which was cultivated more as a bush than as a tree. These few remarks, he thought, showed the force of the observations they had heard as to the necessity of studying the principles under which only success could be hoped for in the introduction of plants or animals from one country to another. Nothing was more useful, and there was no subject which was more worthy the attention of the colonist, in order that, for the future, they might avoid the blunders into which others had fallen through an ignorance of the principles so ably inculcated that evening. He concluded, by moving a vote of thanks to Mr. Masters for his able and interesting paper.

A vote of thanks having been unanimously accorded,

Mr. Masters said he was glad that the subject which he had attempted to treat had met with their approbation, and more so, because the correctness of the principles he had enumerated seemed to be admitted by the meeting. He felt that some of the remarks made had been of considerable utility, whilst the observations of Mr. Simmonds formed a valuable addition to the elaborate paper read by that gentleman last session, a paper the importance of which could not be overrated. Whilst speaking of papers upon cognate subjects, he might allude also to that by Mr. Findlay, as supplemental to Mr. Simmonds's, in which it was pointed out that the character of the productions they received was dependent upon the climate itself. This had a close relation to the question which had occupied their attention that evening; because, in attempting to transfer productions from one country to another, regard must be had to the natural capabilities that existed for producing the same materials in the country to which the plant was to be transferred. The remarks of Mr. G. F. Wilson, with regard to glycerine, were very important, as the successful transfer of seeds depended very much upon excluding the air during transmission. Yet, with all precaution, a great quantity of seed sent to other countries had proved useless. He thought glycerine was worthy a trial. Another point, with regard to the transmission of seeds, was that, in many instances, it was to be feared that the seeds sent from this country had been "cooked,"—a large proportion of bad seed was mixed with the good. It was to be hoped that so vile a proceeding would meet with a deserved check. Publicity, as regarded the reports of the botanical gardens, was an important point; still, he did not think it was so much neglected as Mr. Simmonds appeared to imagine, for if that gentleman would look at the botanical periodicals, he would find, year after year, reports of those gardens. Knowing that to grapple successfully with this subject required the experience of the practical agriculturist, and especially a knowledge of colonial agriculture, as well as of vegetable physiology, he felt some unwillingness to undertake the task. At the same time, he should have done the Society great injustice in supposing that the members were incapable of appreciating the difficulties in the case, and the kind manner in which they had given him their thanks showed that he had not been mistaken in his judgment.

The Secretary announced that the Paper to be read on the evening of Wednesday next, the 26th inst., was "On the Manufacture of Soap," by Mr. W. Hawes. On this evening J. K. Brunel, Esq., F.R.S., will preside.

The Secretary also stated that the Annual Ex-

hibition of Specimens, Models, and Drawings of Inventions would be opened on Monday next, and that Members could have cards of admission to distribute to their friends on application at the Society's House.

EXAMINATION OF INSTITUTE CLASSES.

The following letter, with the subjoined reply, are published for the information of the Institutions.

Liverpool Mechanics' Institution,
March 5, 1856.

Sir,—As the condition which requires Candidates for the approaching Examination to attend at the Society's house, excludes from participation in it those Institutions that are desirous of engaging in the competition, but are not so fortunate as to lie near enough to London; and as the scheme contemplates the holding of examinations in the provinces in after years, I wish to inquire if it has been found impracticable to hold local examinations this year, and (if it be not incompatible with the present arrangements) to request, on the part of this Institution, which consists of above 2,200 members and scholars, that its students may be exempted from attendance in London in June, and may be allowed to compete by means of papers to be sent from the Central Committee, and worked in the presence of a local Committee having the confidence of the one in London, in the manner indicated on p. 2 of the Memorandum on this subject, dated 8th Nov. 1854, and under such other conditions for securing equality of competition as it may be thought proper to impose.

It will be seen in the appended statement of numbers now in the Schools of this Institution, that it has large Day Schools attached to it, the pupils of which, I suppose, are eligible as Candidates for Examination.

I am, Sir, your obedient servant,
ASTRUP CARRIS, *Sec.*

P. Le Neve Foster, Esq., Sec. Society of Arts.

Day Schools.

Boys	600	
Girls	200	
		800
Evening Classes.		
Junior English	37	
Senior „	49	
		86
Junior Arithmetic	46	
Senior „	98	
		144
Junior Writing	51	
Senior „	101	
		152
Elementary Class for Adults ...		50
Drawing	130	
Mathematics	23	
French	49	
German	6	
Spanish	9	
Dancing	16	
		665
		1465

Society of Arts, Adelphi.
London, 19th March, 1856.

Sir,—I have brought your letter of the 5th inst. under the notice of the Council of the Society of Arts, and I am instructed to say that the Council very much regret they cannot comply with the request of the Managers of the Liverpool Mechanics' Institution to alter the existing arrangements which have been made for holding the examinations at the Society's house, in June next. The shortness of the intervening time would, of itself, be sufficient to deter them from making the change suggested. But, independently of this consideration, the Council of the Society of Arts are of opinion, that an examination conducted solely by means of printed questions and written answers thereto—the examiners and examined being far apart—may be open to grave objection. It would be difficult to enforce, by means of committees variously constituted, and by no means equally zealous, the same precise amount of stringent supervision over the candidates; and without this, the most accurate examination of written answers transmitted from remote distances, would be a fallacious test of the actual relative merits of the Candidates. Besides, no opportunity would thus be given for oral examination, which is an integral element of the Society's Examination Scheme.

I am further instructed to bring under your notice a resolution of the Committee of the Leeds Mechanics' Institution, passed on the 26th ult.

"Resolved—That this Committee cordially approves of the scheme of examination laid down by the Council of the Society of Arts in their *Journal* of Feb. 22, 1856, and recommends that the scheme with its details be communicated to the pupils of the Day and Evening Classes of this Institution, with the offer to pay a sum not exceeding £10 towards the expenses of sending four pupils to London for examination; the eligibility of such pupils to be determined by the Head Master of the School, along with the Committee of the Schools and Classes, and that the Examination do take place on Thursday, May 15th."

It thus appears that it is proposed to hold, in May next, a *preliminary local* examination of such candidates as may desire to compete for the Society's certificates and prizes, and, from them, to select four Candidates to be sent up to the Society's General Examination in June. The Council are of opinion that a principle of the utmost value, and susceptible of the widest development, is involved in this resolution of the Leeds Mechanics' Institution—they believe its general adoption would be fraught with many and signal advantages. A previous local selection would, in many cases, save the examiners the trouble and irksomeness of examining and rejecting candidates entirely unprepared to pass any examination whatever. It would in itself be a distinction for a young man to be selected to represent the Institution of his native town, at the Society of Arts General Examination in London.

The Council believe no difficulty would be found in securing the services of well-qualified persons in the several localities, to conduct with efficiency the preliminary local Examinations.

The pupils of your day schools are eligible for examination.

I am, Sir, your obedient Servant,
(Signed) P. LE NEVE FOSTER, *Sec.*

The Secretary of the Mechanics' Institute,
Liverpool.

SPECIAL PRIZE.

The special prize of £25, or a Gold Medal of that value, offered by the Society for the best Essay "On the Means of Preventing the Nuisance of Smoke arising from Fires and Furnaces," has been awarded by the Council to Mr. Charles Wye Williams.

⁂ This sum forms one of two sums of £25 placed by Benjamin Oliveira, Esq., M.P., at the disposal of the Council for Premiums.

The Society's Silver Medal has been awarded to Mr. Charles Hood, F.R.S., for his essay on the same subject.

Mr. Williams has undertaken to print his essay, and will place in the hands of the Council 2,500 copies, to be presented to the members of the Society and to the Institutions in Union.

Foreign Correspondence.

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ECONOMIC MUSEUM.

Brussels, February 26th, 1856.

Sir,—Our Belgian government, in its usual anxiety to promote every measure tending to the improvement of the working classes, has encouraged, and, indeed, has made its own, the project proposed by M. Ed. Ducpetiaux, *Inspecteur des Prisons*, to call together at Brussels, on the 15th of September, 1856, a *Congrès International de Bienfaisance.*

The object of this Congress is to discuss the means of improving the material condition of the working classes. This includes:—

I. Plans, models, materials, and various appliances connected with building.

II. Furniture and household utensils.

III. Clothing and linen.

IV. Food, and the various processes connected with the preparation of food.

V. Tools and instruments for handicraft occupations, both industrial and agricultural.

VI. Worship, physical and moral education, instruction, recreations.

In order to illustrate these subjects, it has been determined that an *Exposition d'Economie Domestique** shall take place at Brussels at the same time.

A committee has been formed, of which I am a member, for the carrying out of this part of the programme.

Our committee naturally applies for assistance to your Society, within whose walls the Great Exhibition of 1851 took its origin, and to one of whose vice-presidents we are indebted for the movement now so satisfactorily progressing in various countries, for establishing public collections of everything that may tend to improve the material existence of the working classes.

The memorandum on this subject, addressed by Mr. Twining to Lord Ebrington, and which I should like to see reprinted in your *Journal*, had, for one of its first results, the exhibition of articles of domestic economy annexed to the Universal Exhibition at Paris, under the especial patronage of their Majesties the Emperor and Empress of the French. Our object is now to form a similar exhibition, on a more complete scale than that could be for want of time.

It is evident that the purpose and requirements of such an exhibition are entirely different from those of universal exhibitions of industry, and I trust, therefore, that British manufacturers, who may feel discouraged at the results of these, will not, by any means, allow themselves to be thereby deterred from joining us in our benevolent endeavours. We require no full assortment of goods, no costly show. We merely ask them to send us a set of patterns of the articles especially suited to the general wants of the million, and that to the value of a very few pounds—in most cases of a few shillings.

The inspection of such a collection of regular trading patterns, with their usual lists of prices, cannot fail to bring back orders to their makers.

Our association for the reform of the Belgian tariff of customs' duties is particularly interested in the success of the Brussels Exhibition of Domestic Economy, the enlightening influence of which on our political economists will be perpetuated by becoming the foundation of a Permanent Economic Museum, and it is contemplated to add to the philanthropic congress, one for the reform of the tariffs of all nations who do not, like your own, enjoy the blessings of free trade.

I remain, Sir, yours truly,
CORR VANDER MAEREN,
Ancien Juge au Tribunal de Commerce de Bruxelles.

Home Correspondence.

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REPLY OF MR. WALLIS TO THE REMARKS UPON HIS PAPER ON "RECENT PROGRESS IN DESIGN, AS APPLIED TO MANUFACTURES."

Sir,—As the correspondence, containing many valuable remarks upon my paper on "Recent Progress in Design as applied to Manufactures," was not read at the Meeting on the 12th inst., I had no opportunity to make any comments thereon. I now ask you to allow me to say a few words in reply to certain points which call for attention.,

Several of the writers have, with more or less success discussed the question as to the *causes* of recent progress in design. This was not the subject of my paper, and, therefore, however valuable their contributions in this direction certainly are, they ought not to blame me for not doing that which I did not undertake to do; although causes were incidentally referred to in the course of the paper.

Mr. Aitken has given a disquisition on the *constituents* of glass, and says he differs with me as to the effects of a want of *purity* in the material. On this point I had nothing to say, inasmuch as it had nothing to do with the question in hand. My remarks referred to the necessity for the crystalline *character* of the material being kept in view in the art forms of decorative glass. The qualities of the glass, or its constituents, are not questions of primary importance in *design per se*, but its peculiar characteristics as a transparent material, transmitting light through the forms in which it appears, is, in my opinion, a most important point for consideration. This I endeavoured to illustrate.

Mr. Aitken, too, should always be quite sure that one man has adopted the opinion of another, or, as his remarks infer, obtained his information without acknowledgement from some other source than his own observation, before he compliments him upon his wisdom! It happens, however, that I cannot accept the compliment he pays me in having wisely adopted the intelligent opinion of Mr. Redgrave, expressed in his paper "On Design," since I have never had leisure to read that paper with the attention I could wish, and am totally unconscious that any such remark as that quoted is used therein. I may say, on this point, that for years I have invariably used the argument in public lectures, etc., that quality and weight of material, however excellent the one, or ponderous the other, can never excuse bad art or negligent handicraft, and the effects of a system which looks to bullion value in the precious metals, has been singularly brought home to myself on several occasions. One instance I will give, as it may be useful.

About four years ago I was applied to for a design for a testimonial, to be presented to a gentleman for whom I was known to have very great respect, alike for his public as for his private character. Not having, at that time, paid much attention to the practical points involved in metallic production, it was agreed that myself and the then modelling master of the Birmingham School of Art, (since deceased), should enter into a little friendly competition, and each make a design, to be submitted to a committee for selection, on condition that we were jointly to direct the execution of the work, whichever might be chosen. The drawings were made, mine was much liked;

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* Copies of the programme of the Brussels Economic Exhibition may be had on application to the Secretary of the Society of Arts.

its elegance, refinement, and so forth, commented upon, but there were three points in which it did not meet the wishes of the parties charged with the selection so fully as that of my friendly rival. The first, which was to my mind quite conclusive against it, was that a *cup* was required, that is, a vessel to drink from, whereas I had designed a *vase*, from not having been distinctly informed on that point. The second was, that the symbolism was of too subtle a character to be easily understood by that super-intelligent individual *everybody!* The third, which amused me and disgusted my poor colleague, was, that it was doubtful if the *weight in bullion* decided upon to give the requisite value to the testimonial, could be got into the form and details which I proposed, and therefore that the vase would not *weigh* enough without loading the parts unnecessarily, and then it would not '*look* enough for the money.' The *cup* was therefore very properly selected for execution, not so much, however, I fear, because it was the best design, although it really was the best as a *cup*, but because the ansation was formed of two figures, which, being cast solid, would weigh each about one fourth of the whole bullion weight, and thus leave the body and foot to be executed in shell-work—the requisite number of ounces being made up by cast work in shields, etc. After this, even if I had not seen it long before, it would not have required a paper on design to satisfy me as to the folly of bullion tests of works of art in the precious metals.

Mr. Aitken wishes that some allusion had been made to the very splendid display of French jewellery in the Paris Exhibition, as also to the new method of casting zinc in iron moulds. On these subjects it has been my duty recently to report to the Board of Trade, in a document not yet made public; it therefore would not have been right for me to have anticipated its publication, especially as these points bear more upon French than English progress in design, the latter being my subject.

I think M. Louis Arnoux has not done justice to Messrs. Rickuss and Tofts' adaptation of the tile, etc. process to vases. He should remember that a great number of excellent things, in many branches of industry, are only clever adaptations or revivals of comparatively old processes in a new direction, or in new forms. With regard to Messrs. Pratt's enamelling process being originally Chinese and Indian, I apprehend as much may be said of the finest examples of manufacture in cotton and silk, and probably even in porcelain! too, or history is strangely at fault. With respect to my supposed neglect of Mr. Minton, in connection with the revival of Majolica and Palissy ware, I doubt if it is in good taste for a public writer to say too much about his personal friends. In this respect I fear I have done an injustice to some of mine, whose works are referred to, but whose names are not given.

I am afraid Mr. Joseph Lockett's good-natured apology for the "willow-pattern" plate, coming after his admirable remarks upon his own special industry, will not do now-a-days; since there is a little too much of the "Oh, it don't matter," and "It is easy to be matched" style of argument in it. Now as good a covering pattern might be obtained by simple mosaic forms in a geometric arrangement, and one, too, which would print quite as easy, and come quite as cheap. Happily, a little more abuse of this monstrous piece of decorative inconsistency will effect its utter repudiation by all persons who *think* about what they buy and use.

Mr. George Jackson's sketch of the rise and progress of a love of art and science in Manchester is a valuable contribution to our knowledge on this subject. I wish he could have recorded as satisfactory a progress in the staple manufactures of that city, as we must acknowledge has taken place in the architecture of the warehouses in which those manufactures are sold.

I think it likely that Mr. James Houldsworth is partly correct in his estimate of recent improvements in the cabinet furniture trade in Manchester. Certainly it shows itself much more there than in most of our large towns. But whilst one sees pagoda-like wardrobes on castors, and bedsteads the type of whose columns, I beg pardon! posts, might, and I have no doubt did, originate and flourish at Carnac or Thebes, the progress seems of a doubtful character. It is true there might be utility in these Egyptian-like bedsteads, together with toilet suites in which wood and marble of marvellous strength and ponderous thickness play such important parts, since they may beget confidence in their proprietor that, should the roof of his house fall in, he would find a secure refuge under the four-poster or the dressing table amidst the crash of crockery and the wreck of mirrors! Our furniture wants less wood and better construction,—more taste and less turnery, simply as such, — better carved work, put in more convenient and less obtrusive places; and lastly, greater adaptation to use and less adaptation to useless *show*.

Apologising for occupying so much of your space in the necessary completion of the task I had imposed upon myself,

I am, yours truly,
GEORGE WALLIS.

Birmingham, March, 18, 1856.

CULTIVATION BY STEAM.

Sir,—In reply to yours of the 15th inst., I beg to say that I should have sent my model at the proper time, had I not heard Mr. Ransome state to the Royal President and members of the Society of Arts, on the 5th instant, that the honour of applying steam to the plough was due to Mr. Fowler, he at the same time knowing that it was I who had applied it, and that, whatever Mr. Fowler may now be doing, it is based upon information he has had from me.

I give Mr. Fowler full credit for the construction of the windlasses, pullies, &c., as applied to draining, and am ready to acknowledge that I commenced my experiments after I had read, in the Report on the Exhibition of Implements at the Lincoln meeting of the Royal Agricultural Society, 1854, the following words:—"Surely," was our remark, "this power can be applied *to more general purposes*. We earnestly commend this idea to our engineers and mechanists;" but I must, at the same time, claim for myself, that the windlasses and pullies as applied to ploughing, were constructed for me by Mr. Fowler, according to the instructions given by me to him at the Royal Agricultural Society's meeting at Carlisle, in July 1855, before which time my patent had been taken out, and my plough had been constructed and applied as far as horse-power could test it. I gave the results of my trial in January, by steam, at your meeting held on the 30th of that month; I tried it again the whole of last week, with the best results, and am now receiving letters of congratulation, testifying to me as to its simplicity and efficiency in working.

I have every reason to believe that Mr. Fowler is now constructing a set of ploughs, and have only to say, that I hope, for the good of my brother farmers and the public, he may get a better plough than I have, but I cannot allow him the honour of being the first efficiently in the field.

I am, Sir, yours respectfully,
W. SMITH.

Little Woolstone.

PATENT GRANTS.

Sir,—It would be useful were Mr. Campin to communicate instances in which the intervention of Crown lawyers has been advantageous to patentees. The interference of a Crown lawyer seems mischievous, on account of the delay it occasions, of the expense incurred, and above all on account of the power it gives to an irresponsible agent to forbid the grant of a patent, though he, in many cases, cannot be acquainted with the subject of it.

I am, Sir, very truly yours,
M. S. BENTHAM.

3rd March, 1856.

A CHAPTER ON YERVA DE PARAGUAY.

Sir,—Messrs. Archer and Simmonds, in dealing with an enormous mass of subjects that move our wonder as to their means of aggregating them, deal with one familiar to me as Souchong is to Cockneys. I allude to the article which Mr. Archer says is called *Maté*, while Mr. Simmonds christens it *Yerba Maté*, and both are in error.

Maté is the Indian name for a gourd, or calabash. *Yerba*, or *yerva*, is the Spanish name for herb. *Yerva de Paraguay* is the name known over all South America and in other places, for the leaves and twigs of a tree in Paraguay, yielding a pleasant and exhilarating infusion. The usual mode of preparing the infusion is in a small calabash, or *maté*, with a neck to it, which, cut off, leaves a small hole, the total contents being about the eighth part of a pint.

Yerva is certainly not a proper name for the leaf of a tree, but it possibly may have been originally adopted to distinguish it from the *hoja*, or *coca* leaf, used in Peru for chewing.

To prepare a *maté* is to make an infusion, but it does not necessarily follow that it will be an infusion of *yerba*, which, as an article "dear bought and far fetched," is prized by ladies and well-to-do people. In the pampas of Buenos Ayres, the poor Gauchos invite the traveller to take a *maté cimarron*, *i.e.*, an infusion of wild herbs, analogous to our nettle tea, or balm, or other herb tea. The word *cimarron* is applied to wild men also, and in Drake's voyage he speaks of the Symerons, or fugitive negroes. In the West Indies they called them Maroons. It is probably a corruption from ancient Moorish times, originally Cis-Marrucco, or *next to Morocco*, as the French now call Spain "Africa beyond the Pyrenees." In some cases, where *yerva* exists not, you are asked to take an *Ayua Caliente*, literally, a warm water, in which a bit of orange or lemon peel is steeped.

But these are beggarly appliances, and the true thing is a *maté de yerva*—"the herb," which is held to be a universal luxury, whether prepared in the simple calabash, or in the silver cup, made in imitation thereof, for the wealthy. *Tomar un maté* is to have a good strong cup of the *yerva* infusion. Whether made in the mansion, the cottage, or the wilderness, the process is as follows:—The water is boiled in a copper pot, big-bellied below, and with a long neck and small opening above; a pot such as I verily believe Ishmael first taught the Arabs to make, from traditions of Tubal Cain. The *maté* is then half filled with *yerva*, after the *bombilla* has been placed in position. The *bombilla* is literally a "little pump," that is, a sucking tube, ending in a perforated bulb, which performs the office of the perforated diaphragm in our teapot spouts. Some use sugar with the infusion, epicures burnt sugar, and others add a piece of lemon peel, just as we folk at home put a black currant leaf amongst the tea. The boiling water being poured on, the preparation is complete, and the imbiber, holding the *maté* in both hands in cold weather, sucks it dry, with care not to burn his tongue. A second water is poured on, and a second person sucks it, and so on till all the strength is gone, when it is emptied and filled again, till all the company is supplied. It is customary for a *maté* to be sent to the bedside in early morning; and in travelling the first thing the guide does after lighting his morning fire is to prepare a *maté* for his patron. The *yerva* is usually carried in a kidskin bag, the sugar in a second bag, and all goes with the *maté* and the coffee-pot into the *alferjas*, or saddle-bags. Poor people use a reed instead of a silver *bombilla*.

The infusion is highly refreshing taken in the ordinary way, but it is occasionally taken with milk, *maté con leché*. For my own part, whenever milk was to be had, and time served, I invariably used the *yerva*, as we do our tea, with the difference of a bullock's horn, or some such contrivance, supplying the place of a tea-pot. It had all the effect of tea, and I believe it contains the principle of *theine*, as well as does the cocoa-leaf of Upper Peru.

The notion of intoxicating qualities in *yerva* is fanciful. It will affect people of weak nerves as strong tea does, but not otherwise.

Nor is there any reason why it should deteriorate by keeping. Chinese tea is carefully packed in leaf-tin; that of Paraguay is packed in bags of dry hide, in large quantities, and when the bags are open a large quantity is left exposed to the air for a long time.

It is brought to Buenos Ayres, by land or river, 1,200 miles, and sells there at about 4 dollars the arroba of 25lbs.

During the wars of the provinces, when the Dictator Francia hermetically sealed Paraguay, the companion of Humboldt, Bonpland, speculated on planting the trees in the district known as the Missions, on the borders of the Paraguay. Whereupon Francia made a razzia, carried off Bonpland and all his people, and kept them captive till his death, a period of about twenty years. The policy of the despot was to admit all strangers to his capital, and never let them depart.

Matés de yerba are one amongst the four cardinal vices of certain parts of South America. One morning, fresh arrived, and lying in a wattled shed, and just waking, I heard my old guide discoursing *more Sancho Panza* on many things, and amongst others the peculiar qualities of his patron. "This man, my patron," said the varlet, "has actually no vices." "*No bebe, no juega, no terna matés, ni signe tras de las ninas.*" "He neither drinks, nor gambles, nor takes *matés*, nor follows after young ladies. "Think of that, my friend!"

On a villainous spur of the Andes, called, if I recollect, the Cuesta de Acay, it was hard sleeping, while running water was freezing, in the open air, night after night, and harder waking, in the dark, with the Three Mariés (Orion's belt) just rising on the horizon. On such occasions, my guide was wont to lace the *maté* with a little aniseed brandy. One morning, feeling very sleepy, stumbling along in the dark over the refuse of an extinct volcano, it occurred to me to ask old Sancho, "How much water did you put in the *maté*?" "*Ninguna!*" (none) was the reply. So it appeared that in the dark, frosty morning, between sleeping and waking, I had sucked through the *bombilla*,—ere sherry cobblers were known,—about half-a-pint of boiled brandy, flavoured with *yerva*—green tea punch with a vengeance. There was no question of the intoxicating quality of the *yerva* under these conditions.

To conclude. Some years back, M. Hervé, an artist, returning from Buenos Ayres, brought with him some cuts of *yerva*, which was sold retail on Ludgate-hill for about 4s. per lb., and it was much liked by many people. It is probable that, with favourable circumstances, it could be imported here at about 6d. to 9d. per lb., and it would be a very useful addition to our stock of infusion making materials.

I am, yours faithfully,
W. BRIDGES ADAMS.

LAND DRAINAGE.

Sir,—Reading over the important part on Drainage, of Mr. Hoskyns' paper, I concluded to give you my experience of a trip to Scotland, per rail, on the 1st of March. In many parts I observed the natural water-courses choked, which being the case, it is needless to talk of sub-soil drainage. I think, if we were to keep in mind the form of a fish's back-bone, we should not be at a loss how to run our drains best. In many parts I have seen pipes sunk into the ground that I am convinced are being rapidly choked up. Indeed, the run of the drains in the Green Park, Piccadilly, did not please me at all. I have drained land in the tropics by clearing watercourses of timber, etc. I have used the bamboo insteadof tiles, in stiff soil containing 90 per cent. of clay, and I regretted often to see nice clean-burnt tiles simply "buried" with but little chance of acting. And I saw much land that, by "surface tapping," would have done much good to the adjacent lands. All this proves that the land surface is not yet efficiently valued in Britain.

Your very obedient servant,
C. M'KENZIE DICK.

23, Newman-street, London, 17 March, 1856.

DECIMAL COINAGE.—THE PENNY.

Sir,—In the Appendix to the second edition of Wingate's Arithmetic, published about 200 years since, is to be found the following table "*of Exchanges of* London *with divers Foreign Cities.*

London doth exchange with	Placentia	*Pence* sterl.	64	for	1 crown.
	Lyons.	,,	64	,,	1 crown.
	Rome	,,	66	,,	1 ducat.
	Genoa............	,,	65	,,	1 crown.
	Milan	,,	64¾	,,	1 crown.
	Venice	,,	50	,,	1 ducat.
	Florence	,,	53½	,,	1 ducaton.
	Naples	,,	50	,,	1 ducat.
	Lecchia in Callabria..	,,	50	,,	1 ducat.
	Barri	,,	51	,,	1 ducat.
	Palermo.........	,,	57½	,,	1 ducat.
	Mesina	,,	56½	,,	1 ducat.
	Antwerp and Colen	£1 sterl.		,,	34½ shill. Flem.
	Valentia.........	,,	57½	,,	1 ducat.
	Saragosa.........	,,	59	,,	1 ducat.
	Barselona	,,	64	,,	1 ducat.
	Lixborn.........	,,	53½	,,	1 ducat.
	Bollonia.........	,,	53½	,,	1 ducaton.
	Bergamo.........	,,	52	,,	1 ducaton.
	Frankfort........	,,	59½	,,	1 florin.
	Genoa*	,,	83	,,	1 crown."

Then follows this remark:—

"*London* exchangeth in the denomination of *pence sterling* with all other countries, *Antwerp* and those neighbouring countries of *Flanders* and *Holland* excepted, with which it exchangeth by the entire *pound* of 20 *shillings English* (or *sterling*)."

Yours obediently,
FREDERIC J. MINASI.

BROOM CORN.

Sir,—The plant which produces this farinaceous seed is extensively cultivated all over Italy, mostly, however, in the middle and northern parts, and is known by the common name of *sagina*, a designation which includes three varieties, but whether they differ botanically, or merely through different modes of cultivation, I cannot say.

The dwarf sagina is sown broadcast at all times in moist districts, but on corn lands as a second crop, after reaping, which is all over by the middle of June. It is only used in its green state as summer fodder for horses and cattle when there is no grass, and is often cut into chaff with straw.

The tall sagina, sometimes eight or ten feet high, is grown only in certain districts, and is that species of which the universal Italian broom is made, all the stems being neatly bound together to form the handle.

The middle size is that which produces the bread corn; and in some districts the only bread used by the inhabitants is made solely from flour derived from the seeds of this plant; very good wholesome bread, however, i commonly made of a mixture of two-thirds wheaten and one-third sagina flour.

In the valley of the *Lago di Bientina*, situated between the Pisan and Lucca hills, the inhabitants subsist entirely upon sagina bread, and though the lake constantly overflows during the wet season, and the land about is very marshy, a position generally most destructive to the teeth in Italy, those who use sagina bread never suffer from decayed teeth. As the plant grows upright, with a single stem, and occupies but little room, the crops per acre are very heavy, and as it flourishes on the cold sides of the Apennines, it does not seem to require much heat in order to bring it to maturity.

HENRY W. REVELEY.

Parkstone, March 5th.

Proceedings of Institutions.

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Deptford.—A lecture on "Love" was delivered at the Literary and Mechanics' Institution, by Mr. E. J. Reed, one of the editors of the *London Mechanics' Magazine*, to a numerous audience, on Wednesday evening, March 12. The subject, of delicate interest to all, was eloquently and philosophically discoursed upon by the lecturer, who also read, with much taste and effect, several of the best pieces on the subject from Tennyson, Coleridge, Bailey, and others. The reading of a long scene from Bailey's "Festus" was the only point in the whole of the Lecture which failed in giving entire satisfaction to all present. The lecture was full of beautiful similes, and poetical descriptions; and the members hope, ere long, to enjoy a similar treat from the same gentleman.

Liverpool.—The Annual Meeting of the Members of the Mechanics' Institution took place on Wednesday evening, March 12th. The Secretary read a report, which contained the following particulars:—Receipts during the year, £3,899 1s. 8d.; payments, £3,418 6s. 6d.; balance due to the Treasurer, £570 17s. 9d., being £480 15s. 2d. less than it was the year before. Number of persons connected with the Institution, 927 members and subscribers to the library; 861 pupils in the day schools; and 471 in the evening schools—a total of 2,259. The report noticed the successful working of the several departments of the Institution, enumerated the donations received during the year, and stated that the Institution was completely self-supported, and never more useful or efficient in its operations. After speaking of the girls' school, the report mentioned that advanced female classes, on the plan of the ladies' colleges of London, Edinburgh, and Glasgow, will be opened on the 1st of April, to afford to young ladies who have gone through the course of instruction ordinarily provided in girls' schools, the means of systematically prosecuting their studies in such directions as their taste may incline. The subjects included in the arrangements so far are botany, drawing, elocution; English, French, German, Italian and Latin languages, and literature; geography, geology, mathematics, natural history, physiology, natural philosophy, chemistry, logic, and music. The services of the most capable professors that could be engaged had been secured for these classes, some of which will meet one hour and others two hours a week. The fee for the former will be 12s. 6d., and for the latter 21s. per quarter. Each lady will join such class as she may think proper, and may afterwards obtain a certificate of proficiency in any subject on passing an examination. The directors recommended that "Liverpool Institute and School of Art," should be adopted as the name of the Institution, in lieu of "Mechanics' Institution," which, although once its fit designation, was inexpressive of its widened scope and purposes, and prejudicial to the success of its later features—its day schools. On the adoption of the report being moved, a lengthy discussion took place, on the part relating to the change of name, but ultimately the recommendation was confirmed by a majority of the members, and the change effected. A number of formal resolutions were then passed, and the meeting separated.

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* Geneva(?)

SEVENOAKS.—On Thursday evening, the 6th inst., Mr. Tell Topham delivered a second lecture, at the Literary and Scientific Institution, "On the Moral Teaching of Shakspeare." The poet's elevated moral views, his poetic philosophy, his lofty didactic teaching, were illustrated by abundance of incidental reference, and the lecturer's reflections were in harmony with the theme throughout. Probably the finest portion of the lecture was that which brought out the poet's humanising influences. The gentleness and tenderness (notwithstanding their rude lives) displayed by the sons of old *Belisarius* in *Cymbeline*, were referred to, to show that no hostile influences could quench the common feelings of kindliness and compassion. It was represented that Shakspeare, in his delineation of the starved apothecary, desired to arouse sympathy for hopeless poverty tempted into crime by "all-seductive gold." The generous and humane nature given by the poet to the magician *Prospero*, in an age when torture and death awaited the practice of sorcery, was intended (it was said) to soften the popular feeling, which sanctioned the penal barbarities endured by *Prospero's* professional brethren. Numerous other instances of a similar kind were presented, and there was such freshness about the matter, and so much persuasiveness about the manner, that one general feeling of satisfaction pervaded the audience.

MEETINGS FOR THE ENSUING WEEK.

TUES. Meteorological, 7, 1, Dr. Barker, "On the relative value of the Ozonometers of Drs. Schonbein and Moffat, based upon daily observations at Bedford;" 2, Dr. Smallwood, "On the Meteorology of Isle Gum, Canada East."
Med. and Chirurg, 8½.
Zoological, 9.
WED. London Inst., 3, Prof. Rymer Jones, "On Entomology and the General Organisation and Metamorphoses of Insects."
Roy. Soc. Literature, 4½.
Society of Arts, 8, Mr. W. Hawes, "On the Manufacture of Soap."
Microscopical, 8.
THURS. London Inst., 7, Mr. R. E. Grant, "On the Natural History of Extinct Animals."
Numismatic, 7.
FRI. Philological, 8.
SAT. London Inst., 3, Mr. E. W. Brayley, "On Geology."
Medical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 13th March, 1856.

Par. No.
46 (1). Burmese War—Return.
89. Barracks—Return.
79. Woods, Forests, and Land Revenues—Abstract Accounts.
53. Bill—Nuisances Removal, &c. (Scotland)
Eastern Papers (Privileges and Reforms in Turkey)—Part 17.
Ecclesiastical Commissioners for England—8th General Report.
Civil Service Commissioners—1st Report and Appendices.

Delivered on 14th March, 1856.

74. Duchy of Lancaster—Account.
87. Fees on Baronetcies, &c.—Return.
90 (1). Civil Services Estimates—Class 1.
92. Masters (Navy)—Nominal Return.
98. Committee of Selection—3rd Report.

Delivered on 15th March, 1856.

90 (2). Civil Services Estimates—Class 2 (a corrected leaf).

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette March 14th*, 1856.]

Dated 5th December, 1855.

2735. Thomas Mara Fell, 49, Frederick-street, Gray's-inn-road—Improved ship's cooking and distilling apparatus, and improvements for the production of fresh water from sea or salt water.

Dated 3rd January, 1856.

21. Edward Vansittart Neale, 4, Russell-place, Fitzroy-square—Improvements in labels.

Dated 8th January, 1856.

57. Claude Louis Pariset, Paris—Improved paste for manufacturing paper, pasteboard, and other similar products.
59. Carlo Pietroni, London-wall—Improvements in printing on cloth and other fabrics. (A communication.)

Dated 21st January, 1856.

157. John Coope Haddan, Cannon-row, Westminster—Improvements in omnibuses and other similar carriages.

Dated 25th January, 1856.

197. Félix Chauchard, Paris—Improvements in the manufacture of paper and pasteboard from vegetable and wood substances.
203. John Beads, Pendleton, near Manchester—Improvements in machinery or apparatus for spinning cotton, wool, or other fibrous substances, where self-acting mules are used.

Dated 4th February, 1856.

295. Alexandre Tolhausen, 7, Duke-street, Adelphi—Improvements in machinery for picking, carding, and combing fibrous substances. (A communication.)

Dated 5th February, 1856.

314. Alexander McDougall, Manchester—Improvements in treating bones, other animal matters, and other substances containing phosphates, for the purpose of obtaining manure and other products.

Dated 7th February, 1856.

332. William Kenworthy, Blackburn—Improvements in self-acting mules.

Dated 15th February, 1856.

391. Edward Oldfield, Adelphi Iron Works, Salford—Improvements in self-acting mules for spinning.
393. Edmund Leach, James Leach, and Edmund Leach, jun., Rochdale—Improvements in machinery or apparatus for preparing, spinning, and drying yarns, and manufacturing the same into cloth.
395. Ebenezer Dobell, Hastings—Improvements in lamp glasses or conductors of light.
397. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in fountain pens. (A communication.)

Dated 16th February, 1856.

399. André Prosper Rochette, Brighouse, near Huddersfield—Improvements in treating soap suds to obtain products therefrom.
401. Frederick Parker, Halve, Trowbridge—Improved apparatus for affording exercise to the human body.
403. Hyam Jacob Hyams, Stanhope-street, Hampstead-road—Improvements in the construction of gas meters.

Dated 18th February, 1856.

404. William Willcocks Sleigh, London—Producing motive power, which he entitles "the hydrostatic motive power engine."
405. Alfred Vincent Newton, 66, Chancery-lane—Improvements in the construction of steam-engines for the purpose of converting the reciprocating motion into a rotary motion, and for operating the slide valves. (A communication.)
407. Henry Hodgkinson, Donegall-street-place, Belfast—Improved machinery or apparatus for bleaching cotton, linen, and other woven or textile fabrics.
409. Moss Defries, Houndsditch—Improvement in supplying oil to the burners of lamps.

Dated 19th February, 1856.

411. William Henry Walenn, 68, Chancery-lane—Improvements in saw teeth. (A communication.)
413. Sylvester Emil Sichel, Bradford—Improvements in apparatus for weaving "ribbed" cloth and bands of "chenille."—A communication.)
415. William Henry Bowers, 4, Singleton-street South, East-road—Improvements in the construction of railways.
417. John Gedge, 4, Wellington-street South, Strand—Improvements in curry-combs. (A communication.)
419. Charles Scott Jackson, Lieut., R.N., 18, Cannon-street, City—Improvement in preserving and disinfecting timber and other substances.
421. William Savory and Henry Arkell, Gloucester—Improvements in apparatus for the passage of water and other fluids.

Dated 20th February, 1856.

425. Thomas Smith and Joseph Gill, Hebden-bridge—Improvements in the mode or method of casing horizontal shafting.
427. James Knowles, Eagley Bank, near Bolton-le-Moors—Improvements in the construction of metallic pistons.
429. John Gedge, 4, Wellington-street South, Strand—Improvements in siphons. (A communication.)
431. John Freer, Rothley, Leicester—Improvements in machines for planting grain and seed, and an improved seed feeder and meter for planting machines.
433. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in steam engines. (A communication.)
435. Jeremiah Clark and James Austin, 13, Moorgate-street—Improvements in apparatus for stoppering or closing bottles, jars, and other similar vessels.
437. Henry Sherwood, Esholt, near Leeds—Improved means of treating the "spun waste" of wool, cotton, silk, flax, hemp, and other fibrous substances, so as to render it suitable for re-working.

438. John Barsham, Kingston-upon Thames—Improvements in the manufacture of cases or packings for bottles and jars.
439. William Oliver Johnston, Broomhill Colliery, Acklington, Northumberland, and John Dixon, High-bridge Works, Newcastle-upon-Tyne—Improvements in cutting and working coal.

Dated 21st February, 1856.

441. Louis Auguste Joyeaux, Marseilles—Improvements in obtaining motive power.
443. William Dawson, Otley—Improvements in machinery or apparatus for cutting paper or other materials.
445. John Gedge, 4, Wellington-street-south, Strand—Improvements in looms. (A communication.)
449. Thomas Turner Chatwin, and John Frederick Chatwin, Birmingham—Improvements in buttons.
450. James Diment, Bristol—Improvements in the manufacture of cements.
451. Charles Frederick Dennet, Lansdowne-villas, Kensington-park, and George Pays, 260, Oxford-street—Improvements in cartouche and percussion cap pouches.

Dated 22nd February, 1856.

453. Frederick William Mowbray, Saltaire, near Bradford—Improvements in machinery or apparatus employed in spinning and doubling.
455. William Vincent Wallace, Great Portland-street, and Benjamin Lawrence Sowell, Harrow-road—Improvements in treating tobacco in order to manufacture cigars and other articles for smoking, together with the manufacture of cigars and cheroots from the tobacco so treated. (A communication.)
457. Leonard Bower, Birmingham—Improved machinery for the manufacture of screws.
459. George Toucas, 39, Rue de l'Echiquier, Paris—New metallic alloy.

Dated 23rd February, 1856.

463. David Jones, Green-hill villa, Ragland, Monmouth—Improvements in obtaining and applying motive power.
465. Samuel Walsh and John Henry Brierley, Stannary Works, Halifax—Colouring and graining skins of leather on one side, and japanning them on the other side.
467. Robert Baker Jones, Limerick—Improvements in cooking apparatus.
469. James Warburton, Addingham, near Otley—Improvements in machinery for combing wool, cotton, and other fibres.
471. William Sangster, 75, Cheapside—Improvement in the manufacture of umbrellas and parasols.
473. Charles Brook, jun., Meltham Mills, near Huddersfield, and Joseph Hirst, Wilshaw, near Huddersfield—Improvement in finishing yarns of wool or hair, and in the finishing of woven fabrics or piece goods.

Dated 28th February, 1856.

506. Francis Prime Walker, Manchester—Improvements in machinery for cutting hay, straw, and other vegetable substances.
508. John Smith, Derby—Improvements in water-gauges for steam-boilers, which improvements are also applicable to cocks used for steam and other purposes.
510. Philip Davies Margesson, Woolwich—Improvements in the manufacture of iron from iron ores.
512. John Fowler, jun., Havering, near Romford, and David Greig, Barkingside—Improvements in ploughing and tilling land.
514. Charles Alexandre de Fonbonne, Paris—Improved apparatus for the manufacture of coke and for blasting, also for the production and extraction of illuminating and combustible gas, as well as ammoniacal and bituminous matters, part of such apparatus being applicable to the consumption of smoke.
516. Richard Archibald Brooman, 166, Fleet-street—Improvements in treating bituminous shale, boghead mineral, and other like schistous bodies, in order to obtain various commercial products therefrom. (A communication.)

Dated 29th February, 1856.

518. John Brierley, Blackburn—Improvements in machinery or apparatus for twisting and doubling yarns for mule-banding and similar purposes.
520. John Graham, Aughton, Lancaster—Improved machinery for cleaning and dressing rice and other grain.
522. Foster Connor, Belfast—Improvements in looms for weaving.
524. William Allen Turner, 125, Wood-street, Cheapside—Improvements in the manufacture of elastic tubing.

Dated March 1st, 1856.

526. William Clark, Upper-terrace, Islington—Improvements in cutting or shaping trowsers.
528. John Reading, Birmingham—Improved fastenings for attaching watch keys, seals, watches, lockets, articles of jewellery, and ornamental articles of dress in general to chains, and for securing the catches of brooches.
530. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in looms for weaving. (A communication.)
532. Louis Uytborck, 74, Montagne-de-la-Cour, Brussels—Improvement in locomotive and other tubular boilers, in which steam is generated.
534. Ferdinand Kaselowsky, Bielefeld, Prussia—Improvements in winding yarns and thread of flax and hemp in spinning and twisting machines.
536. William Chapman and John Henry Teager, Ipswich—Improvements in apparatus for cooking animal and vegetable substances, and for heating steam closets.

Dated 3rd March, 1856.

538. Robert Maynard, Whittlesford—Improvements in machinery for cutting and separating agricultural produce.
540. James Wallace, jun., Glasgow—Improvements in bleaching, washing, cleansing, and drying textile fabrics and materials.
542. John Aspinall, Limehouse—Improvements in machinery for curing sugar, or extracting moisture therefrom, applicable to separating liquids from solids.
544. John Venables, Burslem—Improvements in ornamenting articles made of clay and other similar plastic materials.

Dated 4th March, 1856.

546. Edward Poitiers, 12, Malden-terrace, Haverstock-hill—The application of a new material or materials for the manufacture of brushes and for other purposes, and for improvements in the manufacture of street scavengers' and similar brooms or brushes.
548. Richard Archibald Brooman, 166, Fleet-street—Improved fabric suitable for ladies' garments. (A communication.)
552. James Platt, Oldham—Improvements in machinery for spinning, doubling, and winding cotton and other fibrous materials. (A communication.)

Dated 5th March, 1856.

554. Samuel Clegg and John Kay, Padiham, near Burnley—Improvements in machinery or apparatus for warping yarns.
556. William Billington, Great George-street, Westminster—Improved method of treating wooden railway sleepers.
558. Charles Morgan, Cwm Aman, near Llanelly, and Charles Ranken Vickerman, Kilgetty, near Saundersfoot, Pembroke—Improved preparation of fuel, and the application of the same to steam-boiler purposes.

WEEKLY LIST OF PATENTS SEALED.

Sealed March 14th, 1856.

2081. Paul Frederick Wohlgemuth.
2095. Edward Gibbs.
2108. Feridoon Hankey Smith.
2115. William Rothwell Lomax.
2152. Peter Armand le Comte de Fontaine-moreau.
2155. Francis Xavier Poignand.
2190. George Curling Hope.
2232. François Charles Lepage.
2263. William Lyall.
2309. William Cotton.
2374. Alfred Vincent Newton.
2375. James Smith.
2396. Joseph Charles Frederick, Baron de Kleinsorgen.
2572. Alfred Vincent Newton.
2639. Charles May and Paul Princc.
2837. Agnes Wallace and John Wallace.
2921. Frank Clarke Hills.
2929. Nicholas Douglass.
2931. James Edgar Cook.
11. George Hamilton.
31. Charles Hart.
36. Edward Hammond Bentall
148. Alfred Dawson.

Sealed March 18th, 1856.

2112. Louis Cornides.
2121. Asa Lees and John Clegg.
2125. William Pollitt and James Eastwood.
2127. David Chalmers.
2140. Charles Frederick Whitworth.
2146. John Norbury.
2163. Richard Locke Johnson.
2174. William Neufville Martin.
2179. William Illingworth.
2184. William Kempe.
2213. George Frederick Gruet.
2226. Jean Daniel Pfeiffer.
2243. William Rothera.
2520. John Olive and William Olive.
2717. Frederick Walton.
2912. Thomas Cowburn and George Walker Muir.
12. Harvey Lewis Sellers, M.D. and John Littler Talbott.
85. Alfred Vincent Newton.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

March 11th.

696. John Stather.

March 12th.

630. Robert Christopher Witty.
672. George Rock Lucas.

March 13th.

645. François Durand.
660. George Johnson, M.D.
718. William Keates.

March 14th.

711. Antoine François Jean Claudet.
793. William Edward Newton

March 15th.

652. William Malins.
659. William Blinkhorn.
665. Paul Cameron.
669. Richard Archibald Brooman.
670. Auguste Edouard Loradoux Bellford.
874. Henry William Harman.
2449. Thomas Stainton.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3818	March 15.	Boot	C. and J. Clark	Street, near Glastonbury.
3819	March 18.	Synoptical Needle Case	Joseph Morris and Sons ...	Astwood Bank, near Redditch.